

Petr Stepanov

Materials science. Data analysis. Desktop and web applications development. UI/UX design.

✉ stepanovps@gmail.com 📞 [\(419\) 496-86-02](tel:(419)496-86-02) 🏠 petrstepanov.com

Summary of Qualifications

Work Experience

Research Collaborator (On-Site)

[Thomas Jefferson National Laboratory \(JLab\)](#), Newport News, VA, USA.

Jul 2020 - Current

- Used Machine Learning (ML) TMVA framework to perform binary classification of thousands of signals from a data acquisition (DAQ) setup. [Link to GitHub](#).
- Applied CERN ROOT framework (C++) to perform statistical analysis of a significant amount (over 100 GB) of the raw experimental data of the [Kaon LT](#) experiment at JLab. [Link to GitHub](#).
- Utilized SLURM environment on [JLab supercomputer environment](#) to run resourceful particle simulations on multiple computing nodes at the same time. This decreased the wall computation time by more than 10 times.
- Proposed and implemented RAMDisk functionality on the development environment. This led to an over 60% increase in source code indexing time.
- Set up data acquisition system that performs triggered waveform acquisition from Tektronix oscilloscope to a local Network Attached Storage (NAS) device. RedHat, Ethernet, SAMBA, Python, National Instruments VISA library.
- Committed 50+ shifts at the particle accelerator performing Target Operator and Shift Leader duties ([Pion LT project](#), experimental Hall C).

Postdoctoral Researcher (Remote)

[Catholic University of America \(CUA\)](#), Washington, DC, USA.

Jul 2020 - Current

- Developed a computer simulation based on the Geant4 framework (C++, CMake, Eclipse IDE, gdb) to study optical properties of a novel scintillation material to be used in the EIC detector system. [Link to GitHub](#).
 - Program accounts on scintillation material properties - composition, transmittance, luminescence.
 - Code reconstructs detector response (PMT or MPPC) depending on the quantum efficiency curve.
 - Visualization of optical photon trajectories with respect to their energy or creator process.
- Teaching experience. Mentoring students within a 3-month Research Experiences for Undergraduates (REU) program at the Physics Department at CUA. Giving talks and presentations about [Linux Terminal](#), and [supercomputer environment](#).
- Enhanced debugging of the core library source code led to opening more than [10 bug reports](#) on the ROOT (C++) forum.

Frontend Developer, UI/UX Designer • Freelance

Sep 2012 - Current

- Designed and built online e-commerce store [Sticker Store LLC](#) with static website generator (Figma, Hexo, Snipcart, Bootstrap, SASS, Express.JS, EJS, Node.js).
 - Improved the Google PageSpeed Insights metrics (CLS, LCP) up to 97%.
 - Created a recursive script to export over 300 products from YAML file to Google Merchant.
 - Optimized SEO. Project reached over 1400 organic monthly users.
- Made iOS application (Swift, UIKit, storyboards) for the [We.Team](#) messenger (more than 3k monthly downloads in AppStore). Participated in cloud-based messenger development with enhanced file sharing capabilities (HTML, React JS, SASS).
- Migrated the landing page for [Sweetbridge](#) company from WordPress to Jekyll static site generator (Ruby, CSS). This resulted in a 70% improvement in the page load time.
- Developed the front-end part (Angular.js, HTML, LESS) for [Lili Social](#) network.
 - Assisted with iOS mobile application (Ionic).
 - Enabled SEO crawling of over 1000 Angular.js pages with Google bot.
- Web design.
 - Designed logos, UI/UX prototypes (Figma, Sketch, Illustrator) and branding identity for over [10 different companies](#).
 - Converted numerous design assets and mockups into responsive HTML and CSS.

- Mocked up and integrated dozens of cross-browser responsive email templates.

Research Assistant

[Bowling Green State University \(BGSU\)](#), Bowling Green, OH, USA.

Aug 2014 - May 2020

- Assembled positron lifetime and Doppler spectrometers from ORTEC and Canberra (Mirion) fast electronic units. Utilized High-Purity Germanium Detectors (HPGe) and scintillation-based detector systems for single-photon counting.
- Developed three open-source programs (C++, CERN ROOT) for novel interpretation of the positron lifetime and Doppler experimental spectra.
 - Derived and solved kinetic equations describing formation and chemical of reactions of e^+ and Ps atoms in solids, liquids and nano-powders (Wolfram Mathematica).
 - Incorporated physical parameters (grain size, defect concentrations, rate constants) into custom models (PDFs with convolution) for fitting of the experimental spectra (RooFit).
- Above research allowed for estimation of defect concentrations and sizes in solids, classification of defect types (vacancies, dislocations) and characterization of the chemical decoration of defects.
- Wrote three desktop GUI programs for spectra fitting and interpretation (C++, CMake, ROOT, Qt, Java)
 - GitHub repositories contain over 10k lines of code in total: [TLIST Processor](#), [SW Calculator](#), [RooPositron](#).
 - Extended default ROOT GUI library (Qt-based) to support the MVP design pattern.
- Wrote a GUI application [LuminApp](#) (Java, Swing) to parse and merge time-stamped data from optical spectrometer and thermometer. This increased data processing time by two orders of magnitude.
- Developed static website (Hexo, Gulp, Bootstrap) and visual identity for the [SelimLab](#) research group. Website has a 99% Google performance rank and features 700 ms time to interactive metrics.
- Maintained local Apache HTTP server [physics.bgsu.edu](#) hosting over 10 websites at the BGSU.
- Created website for the [ICPA-18](#) international conference with registration (over 150 users) and payment system workflow (WordPress, PHP, Recurly.js), and [landing pages](#) for events.

Full Stack Web Developer, Web Designer

[Gridnine Systems](#), Moscow, Russia.

Apr 2011 - Aug 2014

- Prototyped and designed interactive mockups for [Otixo](#) cloud file integrator (Balsamiq, Adobe Creative Suite). Utilized Google Web Toolkit (GWT) Model-View-Presenter (MVP) framework to develop application frontend (JavaScript, responsive CSS).
- Responsible for the front-end development of the [ATH American Express](#) – the largest travel management company in Russia (JavaScript, Backbone.js, and RequireJS). Increased the front-end load time by over 30%.
- Implemented image processing servlets on the backend to generate banners for five different social networks (PHP, ImageMagic).
- Wireframed and sliced to web pages numerous UI/UX mockups for web applications (Balsamiq, Photoshop, HTML and CSS).

Computer Science Teacher

[Phys-Tech College at MIPT](#), Moscow, Russia.

Oct 2009 - May 2011

- Provided instructions and guidance to high school students on following computer courses: C/C++ programming, HTML, Adobe Photoshop and 3D Studio Max.

Research Scientist

[Institute for Theoretical and Experimental Physics \(ITEP\)](#), Moscow, Russia.

Sep 2008 - Apr 2011

- Application of positron lifetime spectroscopy for studying the radioactive-induced defects in steels. Monte-Carlo particle simulations with Fortran 95. Maintaining software for CAMECA tomographic atom probe (MSVC). Application of CERN ROOT libraries for fitting and analysis of experimental spectra.

Computer Science Skills

- **Essentials.** Git, SVN, SSH, Linux, and Terminal usage. BASH scripting. IDEs: Eclipse, Xcode, Visual Studio Code (VS Code).
- **Project management.** JIRA, Trello, GitHub, GitLab.
- **Simulation and data analysis:** Geant4, CERN ROOT, MATLAB, Wolfram Mathematica, Maple.
- **Academic writing:** LaTeX, MS Office Suite, Zotero.

- **Data plotting:** Gnuplot, OriginLab, QtiPlot, SciDaVis, Grapher.
- **Desktop app development.** C/C++, GNU make, CMake. Frameworks: Qt, CERN ROOT, Geant4. Java and Swing. Python.
- **Frontend:** HTML, CSS (LESS and SASS), Bootstrap, responsive web design, JavaScript and jQuery, npm, gulp, AngularJS, React.js. Google Web Toolkit. PHP and WordPress themes development.
- **Backend.** Node.js, Express.JS (EJS), Java.
- **UI/UX design.** Figma, Sketch, InVision Studio, Adobe XD, Adobe Photoshop, Adobe Illustrator, Inkscape, Blasamqi, Blender.
- **Apple iOS.** Fundamental Swift skills. User interface development with UIKit and storyboards.

Material Research Skills

- **Characterization facilities.** Positron Lifetime and Doppler Broadening Annihilation Spectroscopy (PALS, DBAR). Atom Probe Tomography (ATP). Scanning Electron Microscopy (SEM). Transmission electron microscopy (TEM). Atomic Force Microscopy (AFM). UV-VIS Spectroscopy. Fourier Transform Infrared Spectroscopy (FTIR).
- **Material processing.** High-temperature annealing. Wet chemical etching. Electrical Contact Fabrication. Sample polishing.

Education

Bowling Green State University (BGSU) • Ohio, USA

Aug 2014 - May 2020

Ph.D. in Photochemical Sciences • GPA 3.423. Novel developments in positron annihilation spectroscopy techniques—from experimental setups to advanced processing software. [View manuscript](#).

- Assembled and utilized two spectrometers: positron lifetime and Doppler. Spectrometers are built from ORTEC and Canberra (Mirion) fast electronic units and utilize High-Purity Germanium Detectors (HPGe) and scintillation-based detector systems.
- Developed open-source software (C++, CERN ROOT) for novel interpretation of the experimental spectra.
- Defined and resolved kinetic equations of reactions of positron and positronium atoms (Ps) in solids and liquids and nano-powders (Wolfram Mathematica). Equation parameters are implemented in the fitting model of experimental spectra (RooFit).
- Above research allowed for estimation of defect concentrations and sizes in solids, classification of defect types (vacancies, dislocations) and more...

Ohio Supercomputer Workshop • Ohio, USA

Jan 2017 - Feb 2017

Hands-on sessions in Supercomputer Essentials. Introduction to the key developments in the supercomputer field.

- RedHat and CentOS operating systems: environment, networking and SSH.
- Supercomputer job control with BASH and SLURM scripts.
- CMake compiling platform, use of parallel nodes, A.I. fundamentals and more..."

British Higher School of Art and Design (BHSAD) • Moscow, Russia

Dec 2011 - Feb 2012

Three-month intensive in Graphical Design and Visual Communications. Lectures and hands-on experience in graphic design and user interfaces.

- Intensive covered following subjects: brand identity, illustration principles, typography and lettering, effective advertising campaigns.

National Research Nuclear University (MEPhI) • Moscow, Russia

Sept 2004 - Feb 2011

B.S. and M.S. in Solid State Physics. Defect studies of neutron-irradiated nuclear power plant vessel steels by means of positron annihilation spectroscopy.

Featured Publications

- P. S. Stepanov, F. A. Selim et al. Interaction of positronium with dissolved oxygen in liquids. *Physical Chemistry Chemical Physics* **2020**, 22 (9), 5123-5131. [10.1039/c9cp06105c](https://doi.org/10.1039/c9cp06105c).
- P. S. Stepanov, F. A. Selim et al. A model for joint processing of LT and CDB spectra of dielectric nano-sized powders. *AIP Conference Proceedings* 2182 **2019**. [10.1063/1.5135836](https://doi.org/10.1063/1.5135836).
- P Saadatkia, P Stepanov et al. Photoconductivity of bulk SrTiO₃ single crystals at room temperature. *Materials Research Express* **2018**, 5 (1), 016202. [10.1088/2053-1591/aaa094](https://doi.org/10.1088/2053-1591/aaa094).

- P.S. Stepanov, S.V. Stepanov et al. Developing New Routine for Processing Two-Dimensional Coincidence Doppler Energy Spectra and Evaluation of Electron Subsystem Properties in Metals. *Acta Physica Polonica A* **2017**, 132 (5), 1628-1633. [10.12693/aphyspola.132.1628](https://doi.org/10.12693/aphyspola.132.1628).
- J. Ji, A. M. Colosimo et al. ZnO Luminescence and scintillation studied via photoexcitation, X-ray excitation and gamma-induced positron spectroscopy. *Scientific Reports* **2016**, 6 (1). [10.1038/srep31238](https://doi.org/10.1038/srep31238).

Conferences

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| 18th International Conference on Positron Annihilation (ICPA-18) Orlando, FL, USA Oral talk "Positions and Ps in Al ₂ O ₃ Nanopowders" | Aug 2018 |
| International Workshop on Physics with Positrons (JPos17) JLab, Newport News, VA, USA Poster "A routine of background subtraction from two-dimensional Doppler broadened spectra" | Sept 2017 |
| 12th International Workshop on Positron and Positronium Chemistry (PPC12) Maria Curie-Sklodowska University, Lublin, Poland Poster "Developing new routine for processing two-dimensional coincidence Doppler energy spectra" | Sept 2017 |
| Ohio Photochemical Society Meeting (Oops) Maumee Bay Lodge & Conference Center, Maumee, OH, USA Poster "Developing new routine for background subtraction in two-dimensional coincidence Doppler broadening spectroscopy" | May 2017 |
| 58th Electronic Materials Conference (EMC) University of Delaware, Newark, DE, USA Oral talk "High-Sensitivity Measurements of Defects in ZnO by Means of Digital Coincidence Doppler Broadening of Positron Annihilation Spectroscopy" | Jun 2016 |
| Annual Spring Meeting of the APS Ohio-Region University of Dayton, Dayton, OH, USA Oral talk "Identification of chemical environment of defects in ZnO by means of digital coincidence Doppler broadening of positron annihilation radiation" | Apr 2016 |
| Ohio Inorganic Weekend Bowling Green State University, OH, USA Poster "Approaching Structural Defect Characterization and their Chemical Identification by Means of Coincidence Doppler Broadening of Annihilation Radiation" | Nov 2015 |
| 41st Polish Seminar on Positron Annihilation (PSPA-13) Maria Curie-Sklodowska University, Lublin, Poland Oral talk "Application of positron spectroscopy for detection of nanostructures in alcohol—aqueous mixtures" | Sep 2013 |

Professional Networks

- Discover my professional contacts [on LinkedIn](#) (200+ connections).
- Get familiar with my scientific career [on ResearchGate](#).
- Skim through the list of my publications [on Google Scholar](#) (24 articles, 200+ citations).
- Find examples of my code [on GitHub](#) (50+ repositories).
- Check out my UI design portfolio [on Dribbble](#) (50+ shots).

Interests

Linux and open-source software. Hosting an [open-source project](#) for keyboard remapping on Linux (300 stars on GitHub).